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(54) [Title of Invention]: TREATMENT PROCESS FOR WATER CONTAINING PHOSPHORUS COMPOUNDS

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SPECIFICATION

1. Title of Invention

Treatment Process for Water-Containing Phosphorus Compounds

2. Claims

(1) A treatment process for water containing phosphorus compounds comprising adding to the water containing phosphorus compounds, at least one metal selected from the group consisting of iron, zinc, nickel, and manganese and/or an oxide therefrom, conditioning the water to pH 8-10 with a pH regulator, and allowing a reaction to take place with said phosphorus compounds, thereby removing them.

(2) A treatment process for water containing phosphorus compounds as set forth in Claim 1, wherein the pH regulator is calcium hydroxide.

3. Detailed Description of the Invention

[Field of Industrial Utility]

The present invention relates to a process for removing phosphorus compounds, which is a suitable process for removing phosphorus compounds, by mixing the water with a metal and/or oxide from iron, zinc, nickel, and manganese, and the like as a flocculating agent.

[Prior Art and Deficiencies Therein]

In the manufacture of electroplated steel sheet by electroplating a metal strip with Zn or Zn-Ni, there are cases which require bonderizing after the electroplating so as to improve the paintability of said steel sheet. This treatment usually uses a liquid treatment containing 25-30% of phosphoric acid. The waste liquid after this treatment contains substantial phosphoric acid.

The treatment processes for waste water containing phosphorus compounds thus generated, that is, the methods for phosphorus removal, can be classified chiefly into 2 methods: a physicochemical removal process which uses chemicals, and a biological removal process based on biological reactions.

Conventional physicochemical removal processes include a flocculate removal using an aluminum or iron salt and one using lime. For the removal of phosphorus compounds where the content of the phosphorus compounds is relatively small, there is a process disclosed in Japanese Patent Application Publication Kokai S57-4288.

The conventional active sludge treatment process calls for adding a flocculating agent such as an aluminum or an iron salt, or the like, in an active sludge treatment unit, thereby carrying out a flocculating classification for removing the phosphorus. This method permits a high removal rate , but it requires installation for rapid agitation, slow agitation, and precipitation, considerably increasing the construction and operation expense . The lime flocculating precipitation process is difficult to maintain and control because of scale formation.

Other methods include a selective ion exchange process which calls for using a fixed bed filled with active alumina for removal of phosphorus, but, unlike the flocculation, produces no sludge; however, the method is considered problematic in terms of apparatus required for treating a large amount of wastewater. The spent resin must often be regenerated.

In the case of waste treatment liquid containing a large amount, such as 300-1500ppm of phosphorus compounds, the method disclosed in the aforesaid

Kokai 57-4288, i.e., the method of flocculation phosphorus compounds on adsorbents undesirably requires a large scale unit.

<Object of the Invention>

It is to address the above situation that the present invention was proposed, which overcomes the above deficiencies, presenting a simple and economical removal method for phosphorus compounds from waters containing phosphorus compounds.

<Makeup of the Invention>

The present invention provides a treatment process for water containing phosphorus compounds comprising adding to the water containing phosphorus compounds, at least one metal selected from the group consisting of iron, zinc, nickel, and manganese and/or an oxide therefrom, conditioning the water to pH 8-10 with a pH regulator, and allowing a reaction to take place with said phosphorus compounds, thereby removing them.
In this invention, said pH regulator is preferably calcium hydroxide.

For treatment of waters containing phosphorus compounds by the process of this invention, the excess metal and/or its oxide which remains unreacted with the phosphorus compounds is converted to hydroxides on raising the pH to 8-10 with a pH regulator, preferably, calcium hydroxide, so that the treated supernatant water contains no metal ions and can be discharged.

Waters containing iron, zinc, nickel, or manganese used in this invention may be a metal-containing wastewater generated in the production of various products; in particular, zinc and nickel are contained in the wastewater when automotive steel sheets are zinc-nickel plated, so that the treatment of plating process waste and treatment of wastewater containing phosphorus compounds can be carried out simultaneously to give economically a two birds with one stone effect, making this an excellent process.

It is preferred for the pH in this invention to be 8-10. At pH less than 8, zinc, iron, nickel, and manganese are highly soluble so that these metals will be found in the treated wastewater, failing to pass effluent standards. At a pH over 10, the flocculation of these metals will be poor; in addition, such a pH adjustment requires considerable alkali agent, making the process costly.

The pH regulator used for regulating pH is preferably calcium hydroxide. The reason is its low cost.

Figure 1 shows a flow chart for carrying out this invention.

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First, reactor 1 is charged with a wastewater containing phosphorus compounds, and then with metal-containing wastewater containing at least one metal and/or oxide selected from the group consisting of iron, zinc, nickel, and manganese, to which calcium hydroxide (a pH regulator) is added, thereby adjusting the mixed liquid to a pH of 8-10.

The mixed liquid is allowed to react while the system is stirred by a stirrer 2 driven by a motor M, which is then led to a precipitator tank 4 via a pipe 3, during which steps is added a polymeric flocculant, for example, Floclan [transliterated, may be misspelled.] manufactured by Katayama Kagaku Kogyo Kenkyusho, Co., Ltd.).

Said liquid mixture is agitated by a stirrer 5, driven by motor M in the precipitator tank 4, thereby allowing phosphorus [and the metal] to flocculate and precipitate; the supernatant water thus obtained after such a process is then discharged out of the system. In the discharge, a different pH regulator (acidic) is used to reduce the pH of the supernatant water to 6-8.

Examples of this invention are now described below.

<Example 1>

A wastewater containing 1124ppm of phosphorus compounds is mixed with the equal volume of wastewater containing 500ppm of zinc compounds for a treatment according to the above working flow chart, the results of which are given in Figures 2 and 3. Figure 2 shows the relationship between pH and removal rate; phosphorous compounds and zinc can be removed using a mixed wastewater adjusted to pH 8-10 with milk of lime to the extent of giving a treated water containing 0.1ppm of phosphorus compounds and 1ppm of zinc, a nearly 100% removal.

The agitation time for precipitator tank 4 is shown in Figure 3, indicating that an agitation for 2 minutes or longer permits a 100% phosphorus removal. A wastewater containing 982ppm of phosphorus compounds and a wastewater containing 380ppm of zinc compounds, 90ppm of iron compounds, 26ppm of nickel compounds, and 15pmm of manganese compounds were mixed at the equal volumes, to which milk of lime was added to bring the pH to 9.7, followed by adding 1.5ppm of a polymer flocullant (for example, Floclan, manufactured by Katayama Kagaku Kogyo Kenkyusho) for agitation for 2 minutes in a precipitator tank 4 to permit removals down to a phosphorus compound level of 0.3ppm, zinc compounds of 0.2ppm, iron compounds 0.3ppm, nickel compounds of 0.2ppm, and manganese compounds of 0.1ppm.

<Example 3>

A wastewater containing 395 ppm of phosphorus compounds and a wastewater containing 550ppm of zinc compounds, 28ppm of nickel compounds, 16ppm of iron compounds were mixed at the equal volumes to which milk of lime was added to bring the pH to 8.8, followed by adding 1.5ppm of a polymer flocullant (for example, Floclan, manufactured by Katayama Kagaku Kogyo Kenkyusho) for agitation for 2 minutes in a precipitator tank 4 to permit removals down to a phosphorus compounds level of 0.3ppm, zinc compounds of 0.7ppm, nickel compounds of 0.4ppm, and iron compounds 0.1ppm .

<Advantageous Effects of the Invention>

As described in detail, the present invention calls for adding to a water containing phosphorus compounds at least one metal selected from the group consisting of iron, zinc, nickel, and manganese and/or an oxide therefrom, and conditioning the water to pH 8-10 with a pH regulator, which can simply and reliably remove from the mixed wastewater, the phosphorus compounds and metal compounds (zinc, nickel, iron, and manganese) at a nearly 100% level. A small scale unit also permits treating a large amount of wastewater.

Mixing two or more unwanted wastewaters can also permit these harmful substances to combine with one another for precipitating and removing them, giving the effect of a substantial cut in costs for a wastewater treatment.

4. Brief Explanation of the Drawing

Figure 1 is a drawing which illustrates an embodiment of this invention.

Figure 2 is a graph showing the relationship between liquid pH and percent metal removal in this invention.

Figure 3 is a graph showing the relationship between the agitation time and percent phosphorus removal in this invention.

Explanation of Symbols

1 Reactor

4 Precipitator tank

5 Agitator

FIG. 1

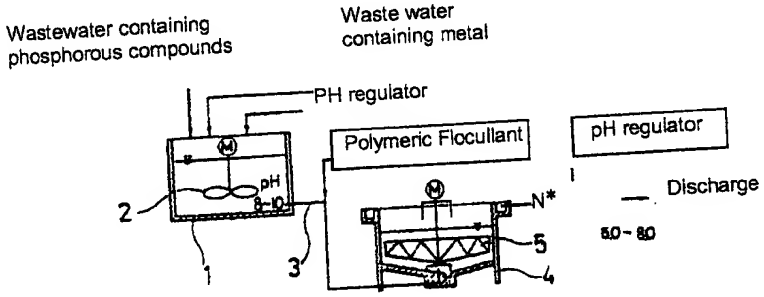


FIG. 2

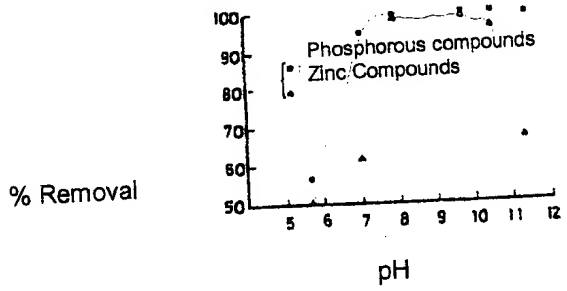
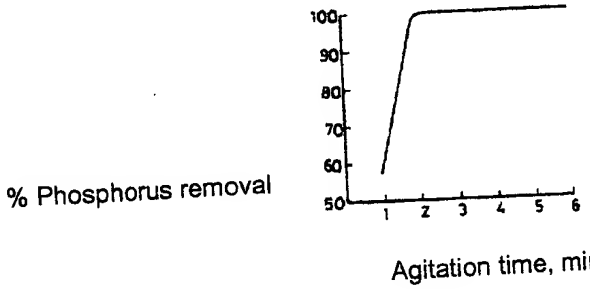


FIG. 3



Trans: Language Services

Chemical Japanese Services

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